

MATHEMATICS DEPARTMENT  
North Carolina State University

ALGEBRA AND COMBINATORICS SEMINAR

Friday, September 19, 2008

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NC State University

Noncrossing partitions and intersections of shards

**ABSTRACT:** The context for this talk is the combinatorics of a finite Coxeter group (reflection group)  $W$ . Starting with the set of reflecting hyperplanes for  $W$ , we cut certain hyperplanes along their intersections with other hyperplanes according to a simple rule. The resulting pieces of hyperplanes are called the shards of  $W$ . The set  $\Psi(W)$  of arbitrary intersections of shards is easily seen to be a lattice under reverse containment. More surprisingly,  $\Psi(W)$  is in bijection with  $W$ , so the lattice  $\Psi(W)$  can be viewed as a partial order on  $W$ .

The lattice  $\Psi(W)$  turns out to have surprising connections with seemingly unrelated questions. The motivating connection is with the noncrossing partition lattice  $\text{NC}(W)$ . We identify  $\text{NC}(W)$  with a sublattice of  $\Psi(W)$ . Specifically, taking a certain subset of the shards (the “sortable” shards),  $\text{NC}(W)$  is identified with the set of arbitrary intersections of sortable shards. This provides, in particular, a new proof that  $\text{NC}(W)$  is a lattice. We also discuss close connections to semi-invariants of quivers.

For those less familiar with Coxeter groups, I will illustrate the definitions and results with a running example, taking  $W$  to be the symmetric group  $S_4$ .

4:00 - 4:50 pm    HA 335

Faculty, students and post-docs are encouraged to attend.